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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
TRAN, BINH X	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 05/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/501,917	KATSUNUMA, TAKAYUKI	
	Examiner	Art Unit	
	Binh X. Tran	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,11-21 and 23* is/are rejected.

7)☒ Claim(s) *10 and 22* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *7/27/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

2. Claim 23 is objected to because of the following informalities: In claim 23, applicants recites "The etching method of claim 13" (emphasis added). However claim 13 is an apparatus claim. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 13-20, 23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 13-20, 23 are drawn to an apparatus claims. According to the MPEP 2114, "Apparatus claim must be structurally distinguishable from the prior art". An apparatus claims cover what a device is, not what a device does". However, in claims 13-17, 19, 23 applicants fail to disclose the structurally distinguishable feature of the apparatus.

Claims 14-20 are indefinite because they directly or indirectly depend on indefinite claim 13.

The MPEP 2114 states "A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim." Further the MPEP 2115 states "Material or article worked upon does not limit apparatus claims" and "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim". Thus, the examiner does not give any patentable weight on the manner of operation of the device or the material work upon of the apparatus claims.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3-8, 13-21, 23 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamada et al. (US 6,159,862).

Respect to claims 1, 4 and 5, Yamada discloses a method for etching a silicon containing oxide layer (208) according to a pattern shape of a mask (212) to form a recesses by using gaseous mixture comprises $C_5F_8/O_2/Ar$ at the flow rate of 6/4/600

sccm (col. 10 lines 31-43, col. 5 lines 49-54). The total (flow rate of C_5F_8 + flow rate of oxygen) divide by the flow rate of argon equals to (6+4)/600 = 10/600 = 0.0167 (read on applicant's value of "smaller than or equal to 0.02). Yamada further discloses the recesses have approximately planar bottom portion formed of the silicon-containing oxide and an approximately vertical sidewall portions formed of the silicon-containing oxide (208), and angled portions formed by the sidewalls portion and the bottom portions being substantially right angled (See Fig 2-12, Fig 16). Yamada does not explicitly disclose the formation of narrow groove shaped microtrenches is suppressed at the bottom portion sides of the angled portions. However, Yamada clearly teaches to form narrow groove shaped microtrenches having the same layer structure and using the same etchant composition. Since, Yamada teaches an identical process using the same material, it is inherently that the formation of narrow groove shaped microtrenches is suppress at the bottom portion sides of the angled portions.

Respect to claim 3, Yamada discloses the ratio equals to 0.0167, which read on applicant's limitation of "greater than or equal to 0.003 (See calculation above). The limitation of claims 4-5 has been discussed above. Respect to claim 6, Yamada teaches the etching is performed by mounting the wafer having silicon oxide layer on a lower electrode (110) of an etching apparatus in which an upper electrode (108) and the lower electrode (110) are disposed to face each other and then applying a high frequency power (124) to the lower electrode (See Fig 1). Respect to claim 7, Yamada discloses the silicon-containing oxide is a silicon oxide film (See col. 7 lines 30-41).

Respect to claim 8, Yamada discloses the etching is performed while a magnetic field (i.e. using magnet 106) is formed approximately perpendicular to a high frequency electric field formed by the high frequency power (124) (See Fig 1).

Respect to claims 13-17, 19, Yamada discloses an apparatus for etching silicon oxide which is capable of forming a recesses and narrow groove shape microtrenches. As discussed above, the examiner does give any patentable weight on the material worked upon or the manner of operation for the apparatus claims. Respect to claim 18, Yamada discloses the apparatus comprises an upper electrode (108) and the lower electrode (110) disposed to face each other, wherein the etching the etching is performed by mounting the wafer having silicon oxide layer on a lower electrode (110) and then applying a high frequency power (124) to the lower electrode (See Fig 1). The limitation of claim 20 has been discussed above (See claim 8).

Respect to claim 21 and 23, Yamada does not use the term "microtrench coefficient". However, Yamada clearly disclose the depth of the silicon-containing oxide is uniform on both side of the angled and other than the angled portion (i.e. ratio equal 1). Further, Yamada teaches the same etching process using the same material as applicant's invention. Therefore, it is inherently that Yamada microtrench coefficient should be the same as applicant's microtrench coefficient.

7. Claims 1-4, 9, 11, 13-17, 19, 21, 23 are rejected under 35 U.S.C. 102(a) as being anticipated by Sato (JP 2001127039).

Respect to claims 1, 9, Sato discloses a method for etching a silicon containing oxide layer according to a pattern shape of a mask (i.e. photoresist) to form a recesses

by using two cycles reactive ion etching (RIE) with a gaseous mixture comprises 7 sccm C_4F_8, 2 sccm O_2 and 600 sccm argon at (paragraph 0018; Note: two cycles read on "first step" and "second step"). The total (flow rate of C_4F_8 + flow rate of oxygen) divide by the flow rate of argon equals to (7+2)/600 = 9/600 = 0.015 (read on applicant's value of "smaller than or equal to 0.02"). Sato further discloses the recesses have approximately planar bottom portion formed of the silicon-containing oxide and an approximately vertical sidewall portions formed of the silicon-containing oxide, and angled portions formed by the sidewalls portion and the bottom portions being substantially right angled. Sato does not explicitly disclose the formation of narrow groove shaped microtrenches is suppressed at the bottom portion sides of the angled portions. However, Sato clearly teaches to form narrow groove shaped microtrenches having the same layer structure and using the same etchant composition. Since, Sato teaches an identical process using the same material, it is inherently that the formation of narrow groove shaped microtrenches is suppressed at the bottom portion sides of the angled portions.

Respect to claims 2-3, Sato discloses the ratio is (7+2)/600 = 0.015 (read on "smaller or equal to 0.015" and "greater or equal to 0.003"). Respect to claims 4 and 11, Sato discloses the inert gas is Ar. Respect to claims 13-17, 19, 23 Sato discloses an apparatus for etching silicon oxide which is capable of forming a recesses and narrow groove shape microtrenches. As discussed above, the examiner does give any patentable weight on the material worked upon or the manner of operation for the apparatus claims.

Respect to claims 21 and 23, Sato does not use the term "microtrench coefficient". However, Sato clearly discloses the depth of the silicon-containing oxide is uniform on both side of the angled and other than the angled portion (i.e. ratio equal 1). Further, Sato teaches the same etching process using the same material as applicant's invention. Therefore, it is inherently that Sato microtrench coefficient should be the same as applicant's microtrench coefficient.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato in view of Yamada.

Respect to claim 12, Sato fails to disclose the gas containing carbon and fluorine is C_5F_8. However, Sato clearly teaches to use C_4F_8. In an etching process, Yamada teaches to use either C_4F_8 or C_5F_8 (col. 4 lines 35-54). Yamada further discloses that C_5F_8 does not contribute to the greenhouse effect even if is it directly released into the atmosphere. It would have been obvious to one having ordinary skill in the art, at the time of invention, to modify Sato in view of Yamada by using C_5F_8 because equivalent and substitution of one for the other would produce an expected result. Further, C_5F_8 gas is environment friendly gas.

Allowable Subject Matter

10. Claims 10, 22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter: The cited prior arts fail to suggest or disclose the first value is greater than 0.02 and the second value is smaller than or equal to 0.02.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Binh X. Tran whose telephone number is (571) 272-1469. The examiner can normally be reached on Monday-Thursday and every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Binh Tran

Binh X. Tran